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EDITORIAL

HeteroPar 2014, APCIE 2014, and TASUS 2014 Special Issue

Parallel computing is an active research field where several issues are still open and need to be carefully investigated to design and implement new solutions for high-performance computing (HPC) systems. Among the many important issues, research work on heterogeneous parallel platforms, industrial and engineering applications, and ultrascale computing can bring important improvements in future parallel computing systems. This special issue includes a selection of papers addressing those issues presented in three workshops that took place in August 2014 in Porto, Portugal:

- the Twelfth International Workshop on Algorithms, Models and Tools for Parallel Computing on Heterogeneous Platforms (Heteropar 2014),
- the workshop on Applications of Parallel Computation in Industry and Engineering (APCIE), and
- TASUS 2014: techniques and applications for sustainable ultrascale computing systems.

These workshops were organized by members of the Nesus Cost Action IC 1305: Network for Sustainable Ultrascale Computing, which is a follow-up of COST Actions IC0804 and IC0805 [1]. The goal of the NESUS Action is to establish an open European research network targeting sustainable solutions for ultrascale computing aiming at cross fertilization among HPC, large-scale distributed systems, and big data management. This network aims at contributing to glue disparate researchers working across different areas and provide a meeting ground for researchers in these separate areas to exchange ideas, to identify synergies, and to pursue common activities in research topics such as sustainable software solutions (applications and system software stack), data management, energy efficiency, and resilience.

We have selected five papers among the 12 submitted to this special issue:

- A Domain-Specific High-Level Programming Model [2], which present a high-level parallel programming model, specifically designed to execute digital signal processing applications on accelerators and regular CPUs.
- In Execution of Compound Multi-Kernel OpenCL Computations in Multi-CPU/Multi-GPU Environments [3], the authors address the execution of compound, multi-kernel, Open Computing Language (OpenCL) computations in multi-CPU/multi-Graphic Processing Unit (GPU) environments.
- The Particle Filter Algorithm: Parallel Implementations and Performance Analysis over Android Mobile Devices [4], which propose an implementation of the particle filter algorithm (an algorithm frequently used in image and video processing, it constitutes the baseline algorithm in many applications: feature tracking, facial recognition, tracking of vehicles in traffic, video compression, etc.) for mobile devices.
- Network-Aware Optimization of Communications for Parallel Matrix Multiplication on Hierarchical HPC Platforms [5] addresses the problem of efficient execution of data-parallel applications on interconnected clusters and present a topology-aware optimization that improves data partition by taking into account the entire communication flow of the application.
- In A High Level and Accurate Energy Model of Parallel and Concurrent Workloads [6], the authors have developed an energy model and a methodology to automatically extract features that characterize the computational environment relying only on a single power meter that measures the energy consumption of the whole system.

The selected papers cover very important scientific issues encountered nowadays such as the following: CPU/GPU execution, system-on-chip programming, parallel algorithms taking into account various constraints (energy, communication, etc.), programming models, and so on.

We really hope that the reader will enjoy this high-quality issue, and we are sure that she/he will find it highly relevant to the state-of-the-art of today's heterogeneous and parallel computing.

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